Financial Management and Planning

Assignment: Capital Project Appraisal Presentation

Course : MSc Industry 4.0 Advanced Manufacturing
Module Code : ACPA7002

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" Innovative process
AM (3D Printer) Investment "

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INTRODUCTION

In Recent years design for industry is the famous trends addressing the interconnection of product , people and machine.

The innovation is to creation of new high tech and performance material to reduce manufacturing cost by developing the production process . The product can be designed with new set design principals.. The new emerging technologies in smart manufacturing and analysis.

The design will be extended to innovative solution in which 3D printing technologies will be exploited for

-**Weight reduction** (originally part was in metal machining , with AM its material changed from aluminium to ULTEM and redesigned which reduced weight by 49%. Also Vac form parts manufactured from Additive manufacturing process.

-Tooling cost saving by new process development , in which existing VAC form parts can be manufactured in-house with AM . [Troy McMillan (2020)]

Project implications – value to business

The proposal for 3D printer (Based on requirement & costing plastic filament based model were approved). [3dgbire (2015)].

Its importance :

- Speed up the manufacturing process
- Time saving – to develop any prototype
- Cost saving : tooling cost saved .
- Reduce defect rates.
- Less waste
- Production on demand
- Easy to upgrade for metal filament in future

3DGBIRE

Metal 3D printing refers to the selective laser melting and direct metal laser sintering. These processes use metal powders to produce complex and one-piece metal parts.

Timeline for implementation

Timeline as per the project requirement ..

Need to implement before the design phase activity complete. So that we have make some prototype to finalised the design phase.

Discussion with higher management for this investment. Points like its need, technology understanding, and manufacturers were considered.

Sample prints were requested and evaluated to understand the cost factors which is very important in terms of financial discussion. (Ref Report page 5)

Approvals :

Internal resource
Project team
HSE team

[Karalia (2021)]

Cost of project

Improvement objective in SAFRAN

Development in team and business / no waiting for production printer.
Supplier lead time effects our delivery commitment to Aircraft customer. [Project finance. (2012)].

Revenue drive : Following point discussed and considered

cost per unit quotation
Count of units purchased
Month of purchase
Avg sales price of product that each type creates
Average monthly

3DGBIRE

Amortization duration : 3 years (process of repayment of debts through periodic instalments over period of time.)
Cost around : £15000 /per unit
Total 3(qty) : £45000

[3DGBIRE Ltd are experts in everything 3D printing. They supply the most innovative certified Additive Manufacturing equipment]

Project lifespan & funding

Process study and its importance

Example : Within one of the project due to clash between two parts (approx 3200 parts - 45 aircraft), supplier needs to modify metallic part and costing was pretty high when manufacturing / material and man hr included. Man hours €300K estimated.

Corrective action:

Placement of damper between the structural beam and bracket to avoid a clash. due to the lead time for VAC form parts, a customer might get a penalty. So the solution of additive manufacturing was introduced with minor lead time & easy installation which saved the man-hour cost per seat.

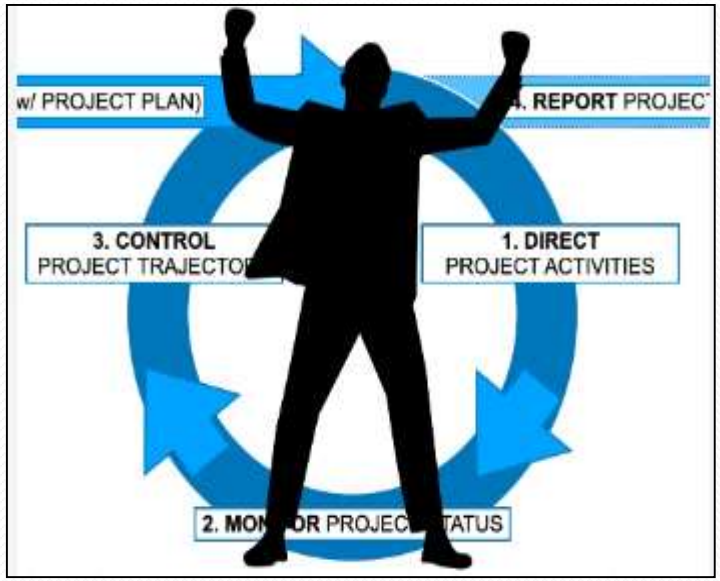
This process helps to minimize the industrial lead time with fast technical validation. Safran delivered the product on time and built healthy customer relations for future in-service solutions.

Project proposed & approved with company (internal funding), which further involves budget / project management / revenue streams.

Project life considered 5 years and looking fwd as long term investment prospective. The other option was externally Bank / Gov grand or Equity finance.

Project implementation issues

The following issues were studies during the implementation of this project.



Redundancy: There was no redundancy in the job, as all the machine was set up in the desired location. Instead, the company provided AM machine operation training to the design and industrialization team for performing the work in-house. External dedicated trainers were appointed and the cost of training was approved by higher management.

Disruption: In terms of reduction in vulnerability, additive manufacturing breaks all the links in the supply chain and will bring the manufacturing items produced close to the customer. [Ivanova, Olga (2013)].

Downtime: The organization does not experience short and long downtime. Another unplanned downtime is well controlled. In terms of servicing on time by performing preventive maintenance, and upgrading software or hardware if required. Invest in staff training/day after the setup

Business rationales

Business rationales:

- Payback i.e. less than 2 years
- IRR greater than 20%
- Positive NPV from a WACC of 15% [Withers, Mark (2010)].

•Pay back mainly reflects the liquidity and risk of project... If shorter means project recovers initial cost faster. [PB = Initial investment /cash flow per year]

•Internal rate of return (IRR) : New profit / Cost of investment)*100 (Higher IRR means higher return on investment)

•Net present value (NPV) = Cash flow / (1 + i)^t – initial investment

3D Printer (Additive manufacturing)					
Project	Investment	Year 01	Year 02	Year 03	Year 04
Present Value	-£45,000	£14,000	£16,000	£18,000	£20,000
Payback period	**3 Years**				
Discount Rate (WACC)	**15%**				
Denominator	1	0.87	0.756	0.658	0.572
Future Value	-£45,000	£12,180	£12,096	£11,844	£11,440
Results					
NPV Excel	**£2,542.57**				
IRR	**18%**				
PI	**2.06**				
BCR	**1.06**				

Note :

Denominator to capture form present value table % as specified. (Refer next slide)

Business rationales

NPV

The value for NPV is calculated as per the excel formula : £2542.57
Formula entered into the gray NPV cell is: =NPV(green cell, yellow cells) + blue cell

=NPV(C3, C6:C10) + C5

	A	B	C	D
1				
2				
3		Discount Rate	15%	
4				
5		Initial Investment	-£ 45,000.00	
6		Year 1	£ 14,000.00	
7		Year 2	£ 16,000.00	
8		Year 3	£ 18,000.00	
9		Year 4	£ 20,000.00	
10				
11		NPV	£ 2,542.57	
12				

Periods (*n*)	Interest rates (*r*)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Denominator to capture form present value table % as specified.

IRR

The value of IRR is calculated by considering the sum of yearly present value in excel

= IRR(C4;G4)
= 18%

C12 =IRR(C4:G4)

	A	B	C	D	E	F	G
1							
2		3D Printer (Additive manufacturing)					
3		Project	Investment	Year 01	Year 02	Year 03	Year 04
4		Present Value	-£45,000	£14,000	£16,000	£18,000	£20,000
5		Payback period	3 Years				
6		Discount Rate (WACC)	15%				
7		Denominator	1	0.87	0.756	0.658	0.572
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14		BCR	1.06				
15							

Business rationales

MANUFACTURE ADVANCED DESIGN ENGINEERING

PI (Profibility Index)

The value of IRR is calculated by considering the(sum of future value + investment) / Present value. As shown in the excel image.

PI = (SUM(D8:G8)+45000)/-C4
= 2.06

C13 =(SUM(D8:G8)+45000)/-C4

	A	B	C	D	E	F	G
1							
2		3D Printer (Additive manufacturing)					
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10		Results					
11		NPV Excel	£2,542.57				
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13		PI	2.06				
14		BCR	1.06				

BCR (Benefits cost ratio)

The value of BCR is calculated by considering the (sum of future value) / Present value. As shown in the excel image.

BCR =SUM(D8:G8)/-C4
= **1.06**

C14 =SUM(D8:G8)/-C4

	A	B	C	D	E	F	G
1							
2		3D Printer (Additive manufacturing)					
3		Project	Investment	Year 01	Year 02	Year 03	Year 04
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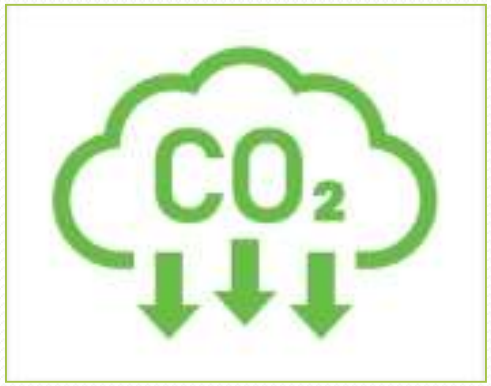
Sustainability



Designed component is sustainable / Recycle , low carbon .

The Additive manufacturing process itself provides a more sustainable means of production. In this process, 3D printing eliminates the excess material. Also, the ability to create generative shape designs. Also its time saving and eliminates long transport and storage areas thus reducing carbon footprint. [Safran (2022)].

Weight optimisation
Lighter Material implementation.
New manufacturing techniques (AM)
Re-use of existing parts .
Recycle material to use on other parts

Organizational Benefits

This research analysis helps my organisation to design and develop there seating components from following points.

- Light weight seating system.
- Advance material implementation for circularity.
- Cost reduction AM processes
- New learning financial attributes towards investment.

Innovative Ideas development for organisational growth of the systems

Conclusion

During 2023 Safran has delivered significant achievements across all aspects of Environmental, Social, and Governance ('ESG'). In terms of sustainability, the material used within additive manufacturing will eliminate the excessive use of filament (material). The supplier cost and the transport cost will be reduced resulting in less co2 emission.

This project increased the efficiency and accuracy to build the product with minimum lead time to satisfy the customer's requirement. Implementing the new process reduced the tooling cost required in the previous manufacturing process. Looking at the ratios & performance everything is within the plan and budget. SAFRAN organization investment is highly productive to new material and process innovation with this technology now available in-house.

This project report & this supporting presentation concludes that additive manufacturing is an important technology in digital production. Plays a key role in global manufacturing, digital transformation, and supply chain resilience. The role of this Industry 4.0 technology in the environment and society is significant.

This module outcome helped to learn financial and accounting concepts & its application on investment projects to take financial decision accordingly. Also upgraded myself as a team to bring this concept of process development in seating & providing adequate reference to prove this investment will be beneficial for the organization in the long-term prospective.

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Thank You